Update on the validation sites in Kenaston Saskatchewan

Aaron Berg[1], Tracy Rowlandson[1], Sarah Impera[1], Brenda Toth[2]

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[1]University of Guelph, ON Canada

2 Environment Canada, Hydrometeorology and Arctic Laboratory, Saskatoon SK, Canada

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Outline

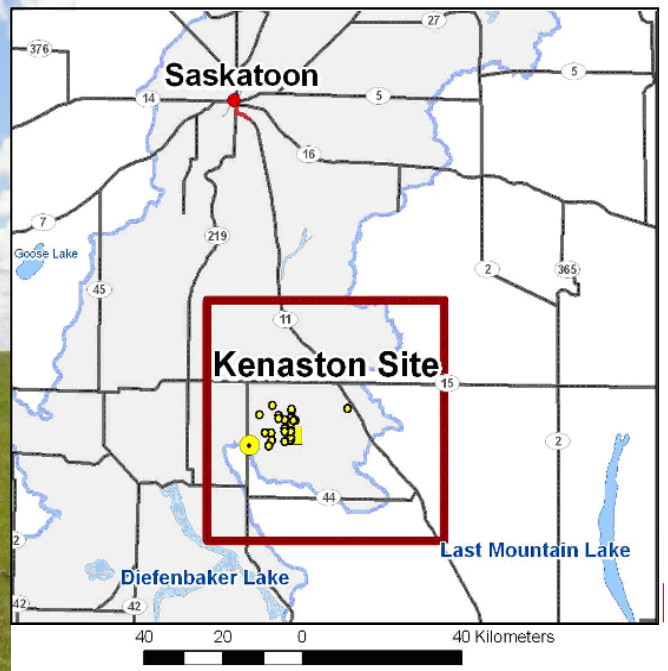
- Overview of the Kenaston Saskatchewan Networks
- Calibration of the networks during CanEX-SM
- Future plans for the Kenaston network

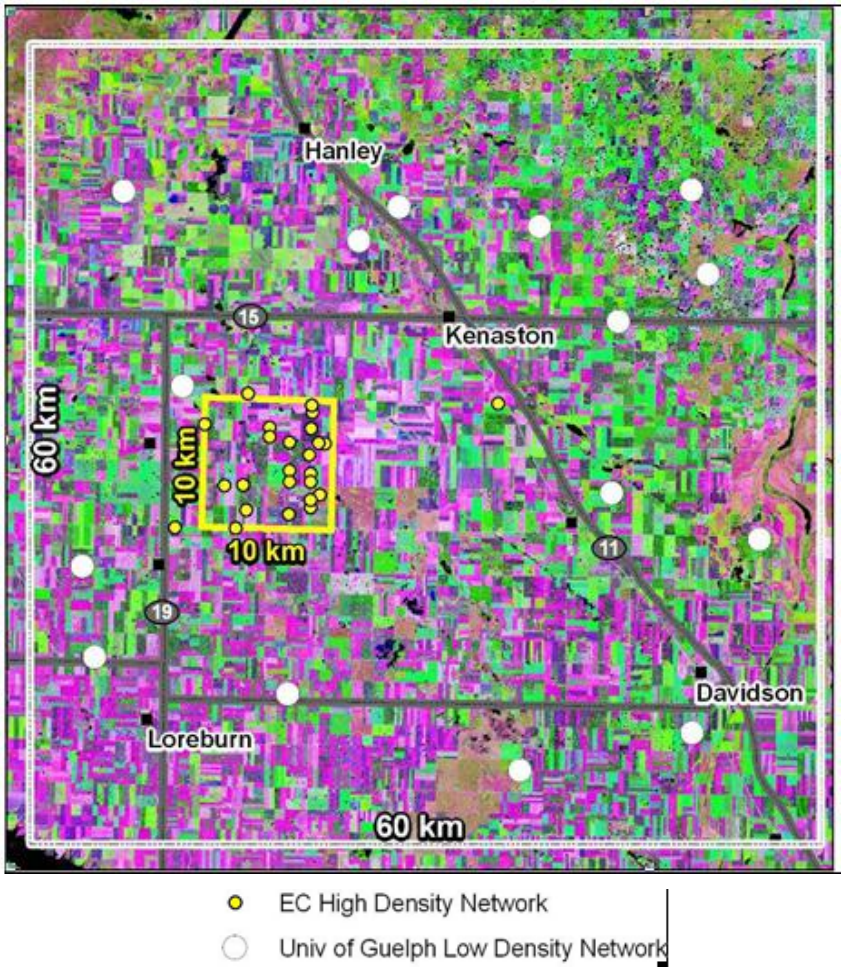
Kenaston soil moisture site

Slide by: Wheater

- The Kenaston research site in the larger river basin.
- The Saskatchewan river basin includes regionally and globally-important biomes with some of the largest climate variability
- Representative of many of the major water resources challenges faced by water mangers world-wide.

Study site – Kenaston/Brightwater Creek





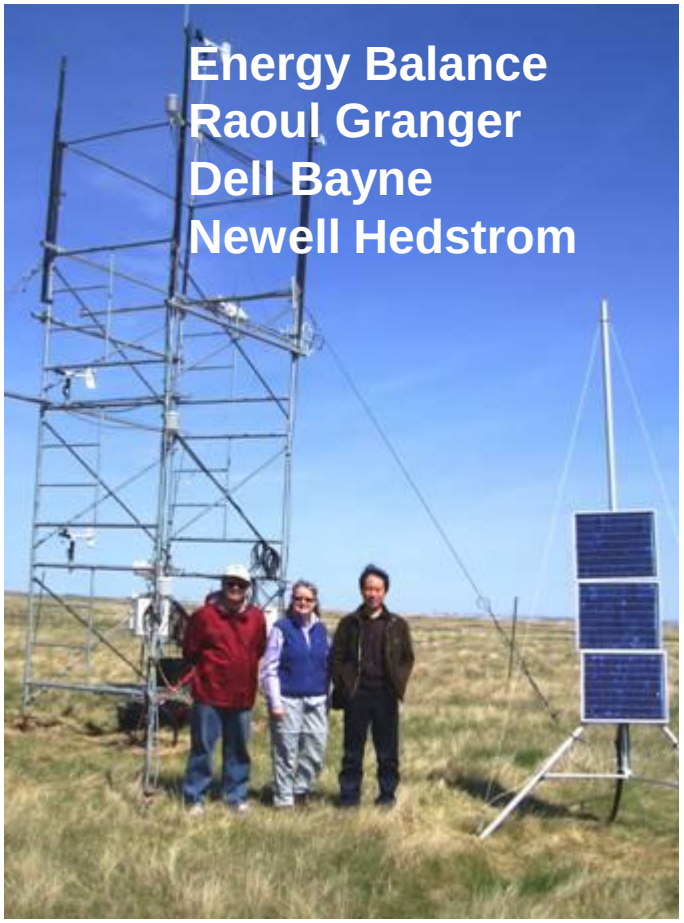
- 24 sites (EC)
- 10 x 10 km grid
- Additional 16 sites (U of Guelph)
- 60 x 60 km grid

51.5° N
106.283° W
Operating since 2007

Physiography

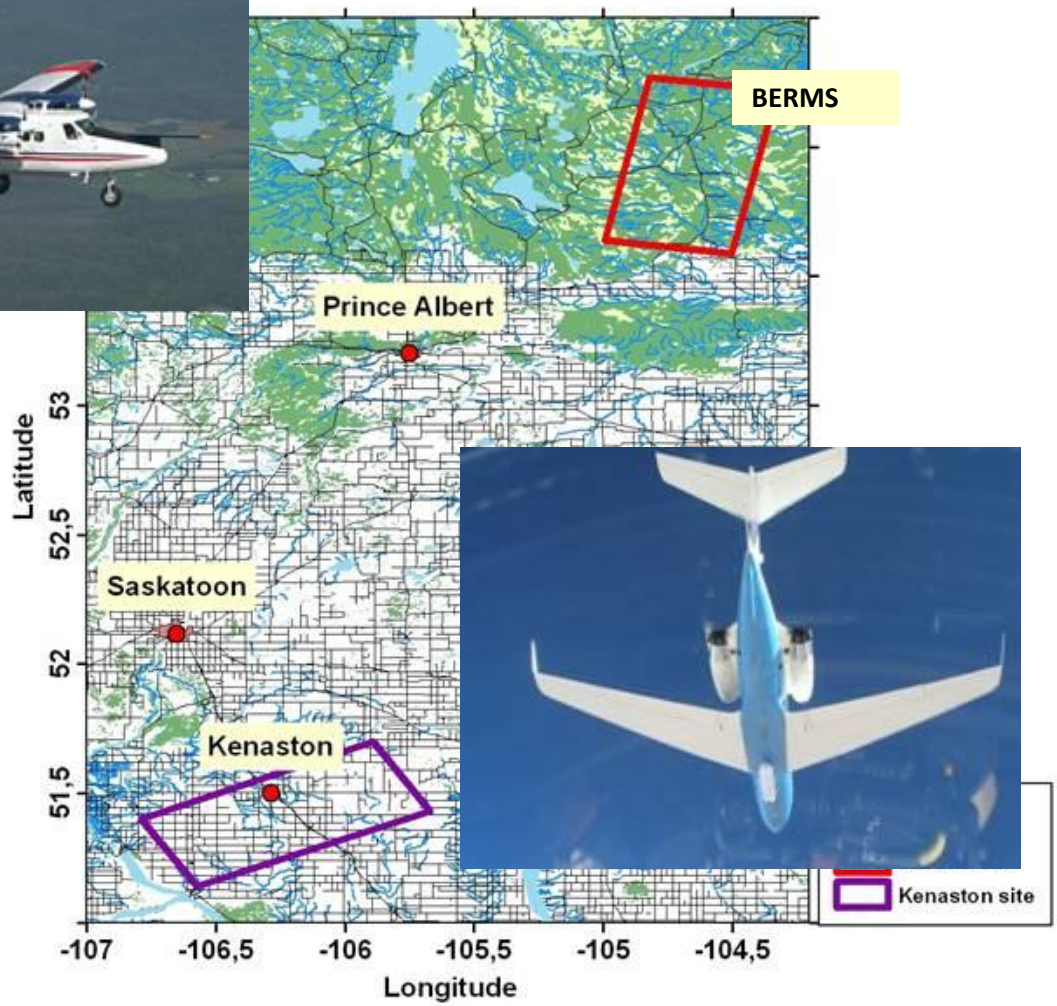
- Moist, mixed grassland ecoregion
- Primarily cultivated with cereal crops, with areas of native grassland and pasture.

Multiple Collaborations over the Saskatchewan Site



Collaboration – CanEx-SM10

SMOS validation
SMAP pre-launch algorithm development



Partners
EC, NASA, AAFC, CSA, U of Guelph, U of Sherbrooke

Kenaston
40 times series sites+ 20 additional ground truth sites

BERMS
20 time series sites + temporary time series sites + additional ground truth sites

Typical Soil Moisture/Precip site

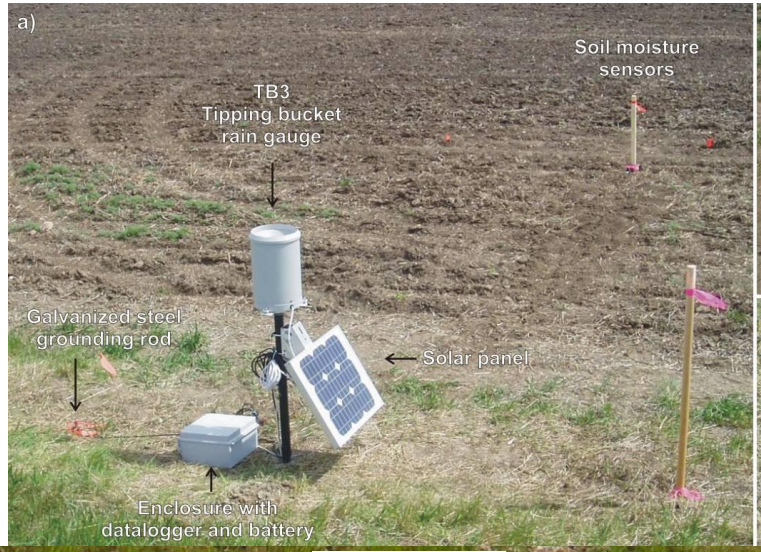
3 depths/orientation
- 5 cm vertical (EC), horizontal (EC and U of G)
- 20 cm horizontal
- 50 cm horizontal

Stevens Hydra Probe II
Site specific calibration

EC 24 sites
U of G 16 sites

Temporal Frequency :
- Hourly

Variables Observed:
- Soil temperature
- Soil Moisture
- Precipitation



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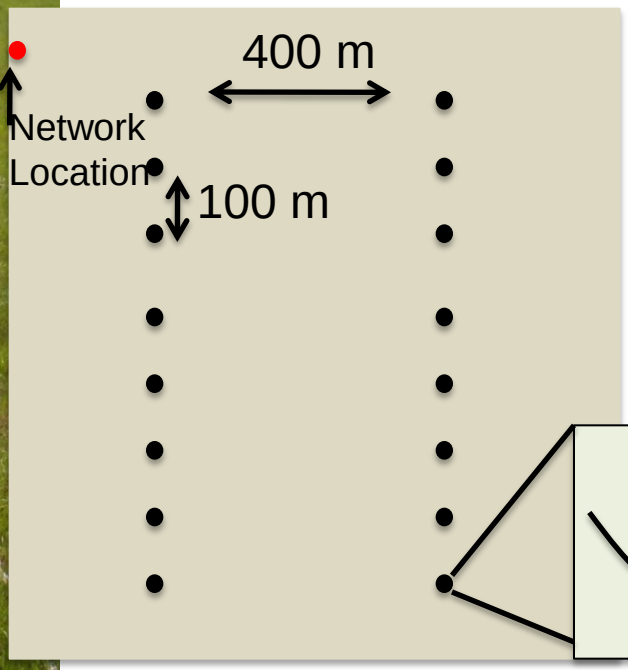
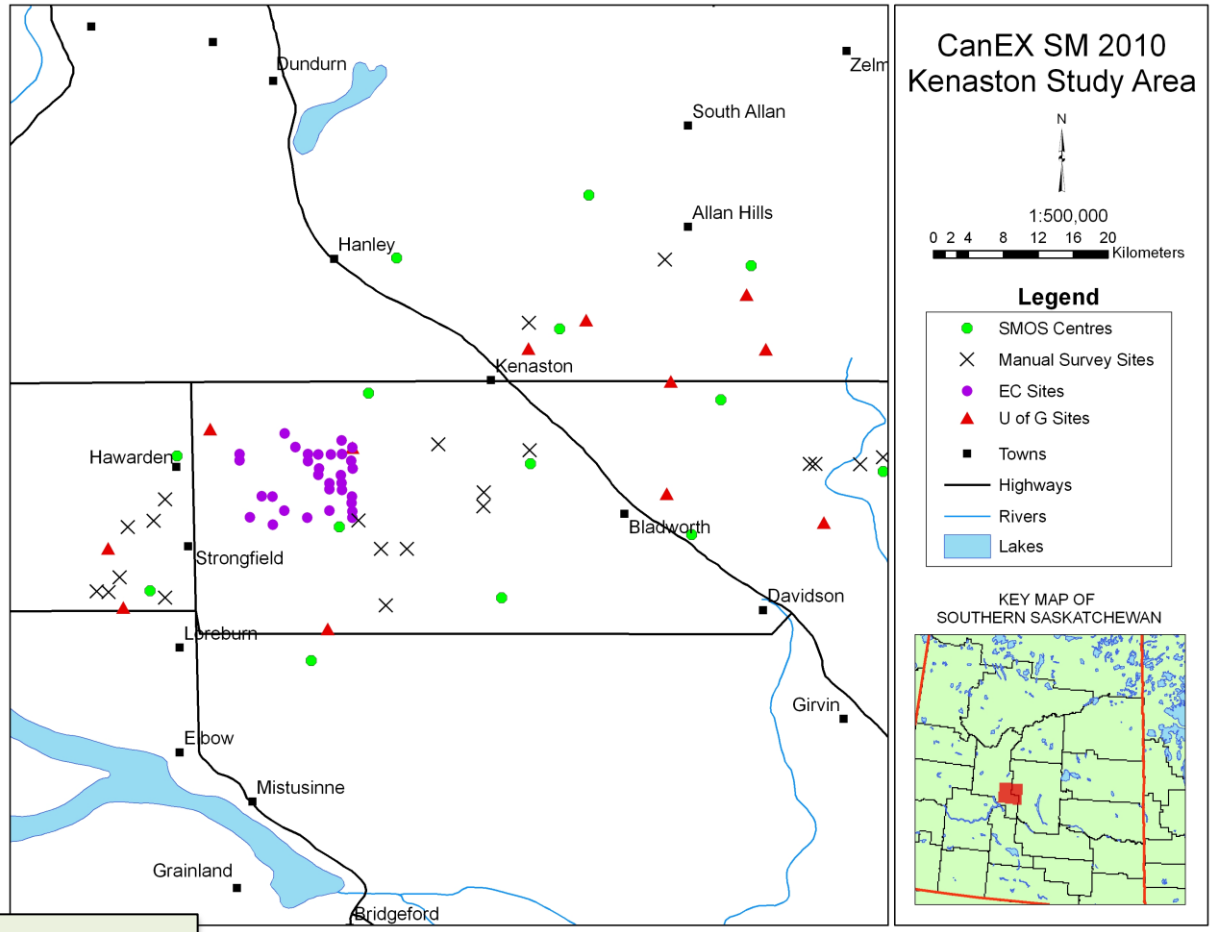
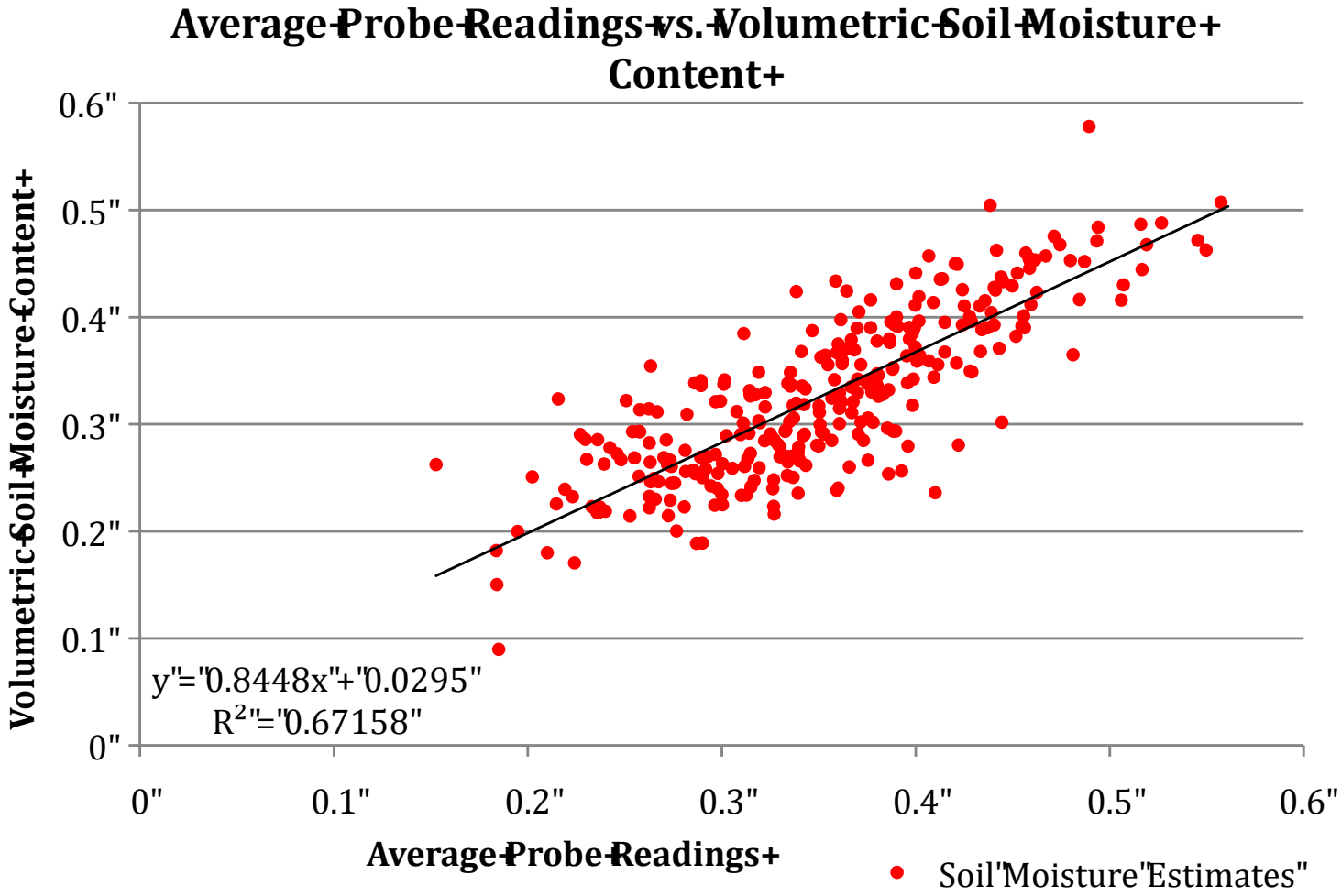
Soil Moisture Sampling Structure During (

Networks sensors are at only one location

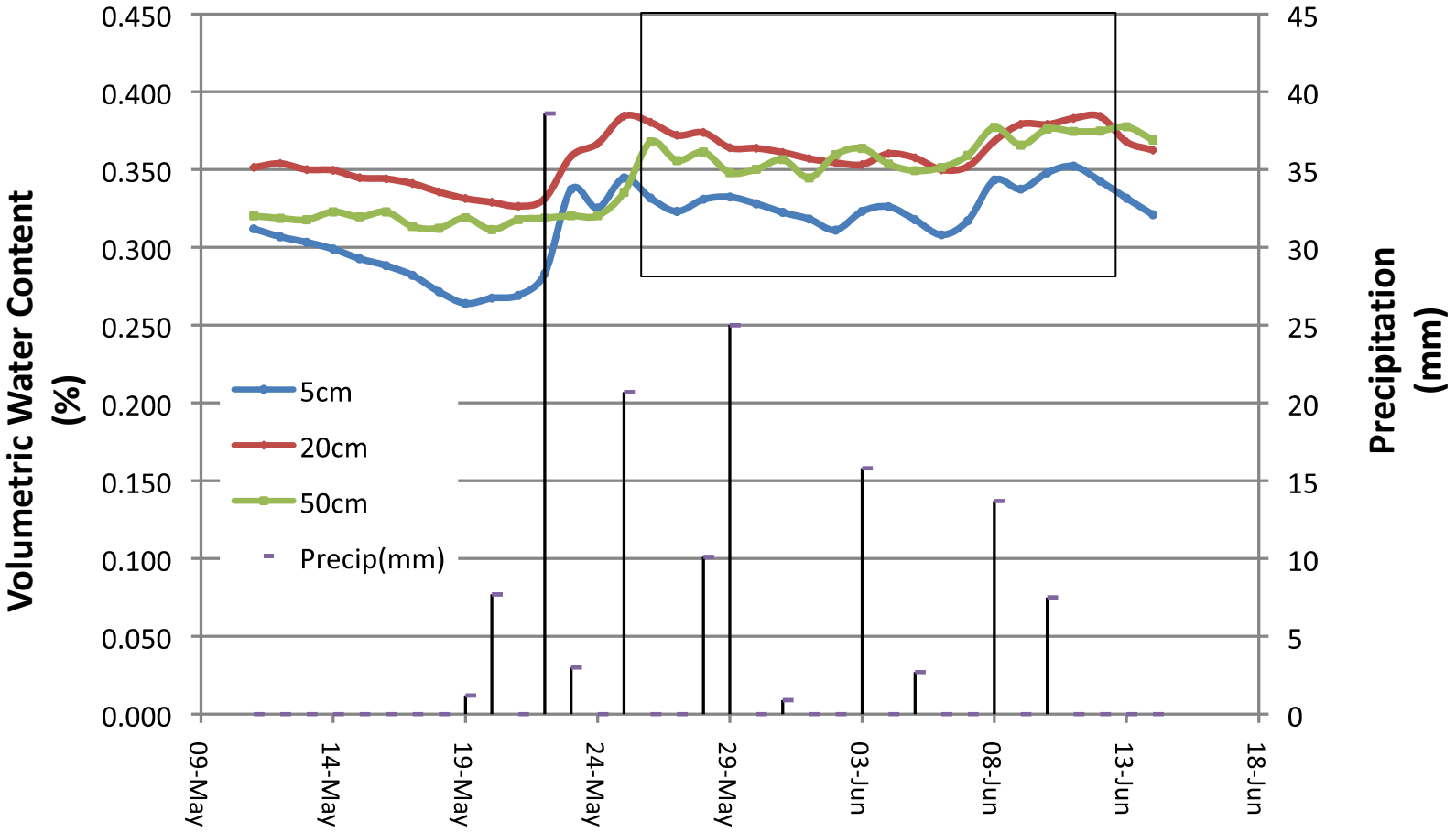




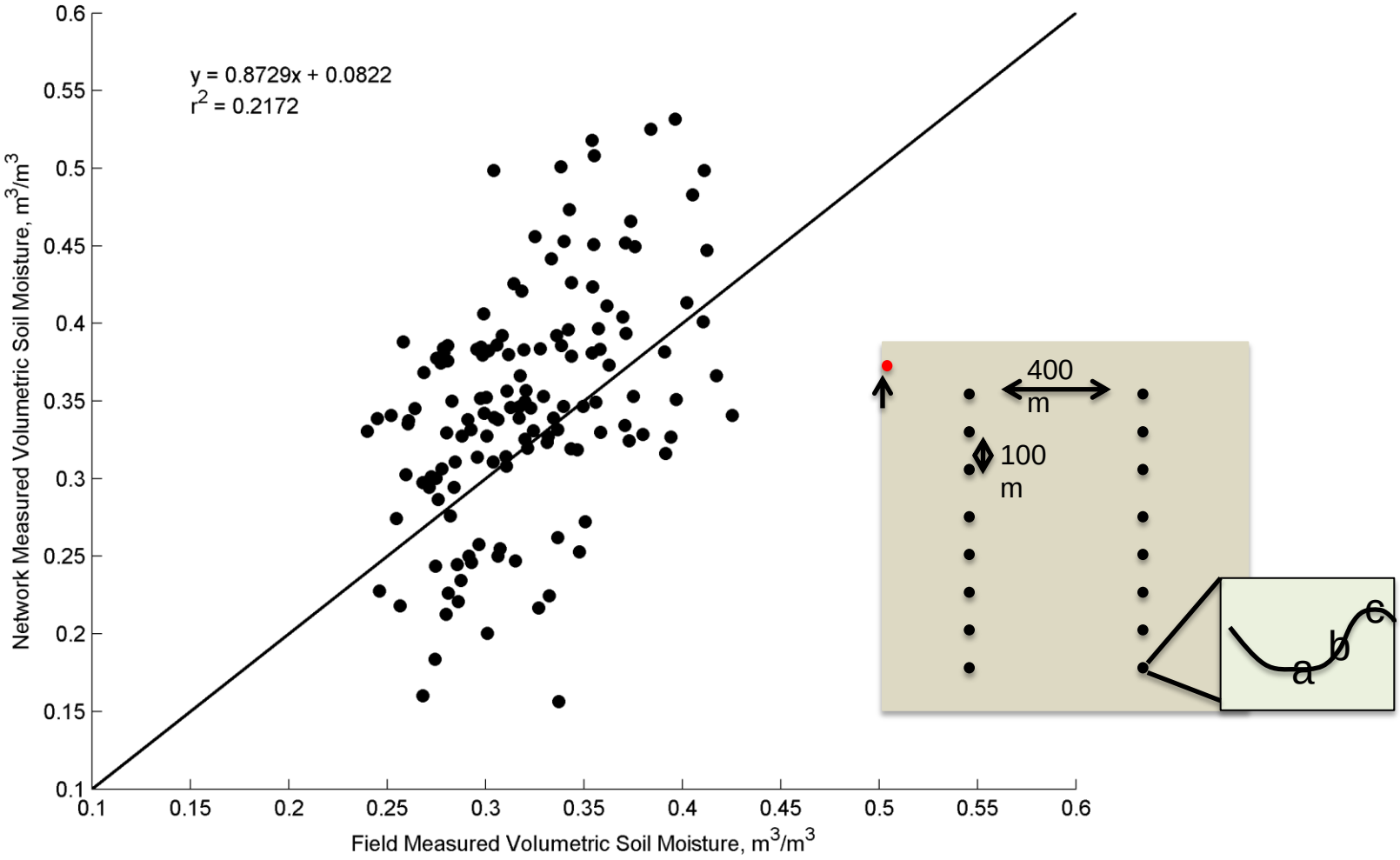


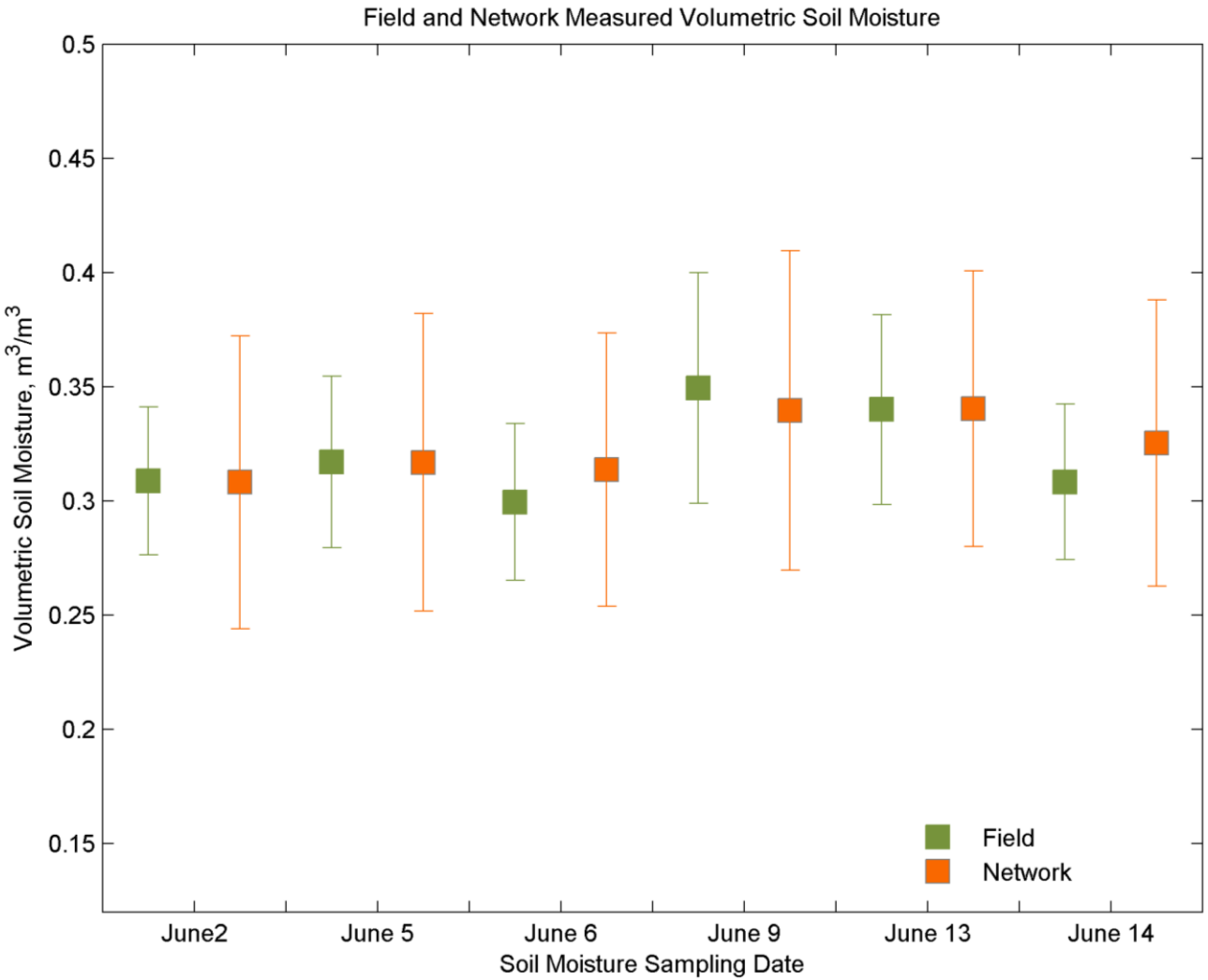
	Adjusted R^2	RMSE
Un-calibrated	0.67	0.045
Calibrated	0.82	0.037

Average Soil Moisture Time Series During the CanEXSM-10 Campaign

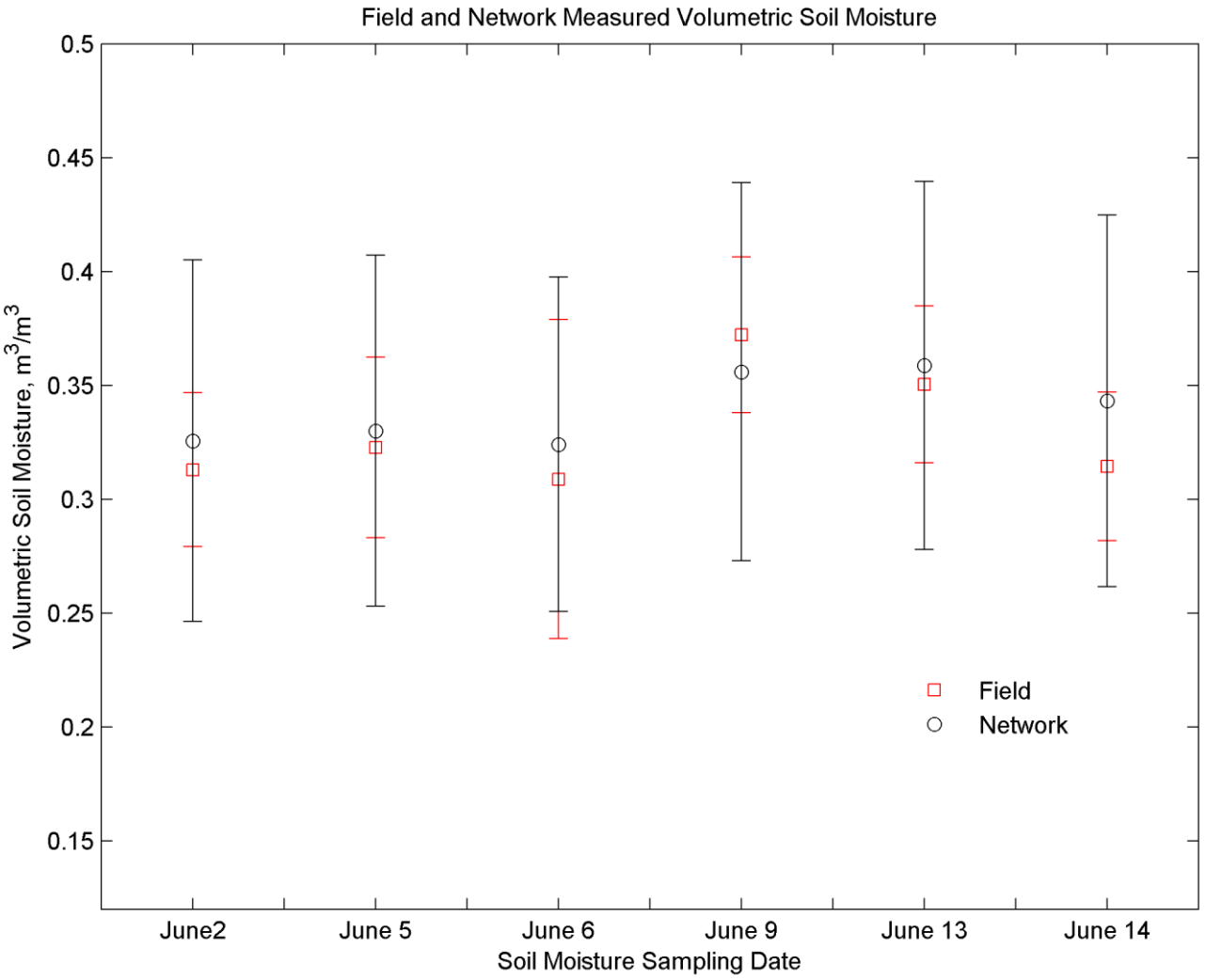


Relationship(?) between Network Sensors and Field Averages



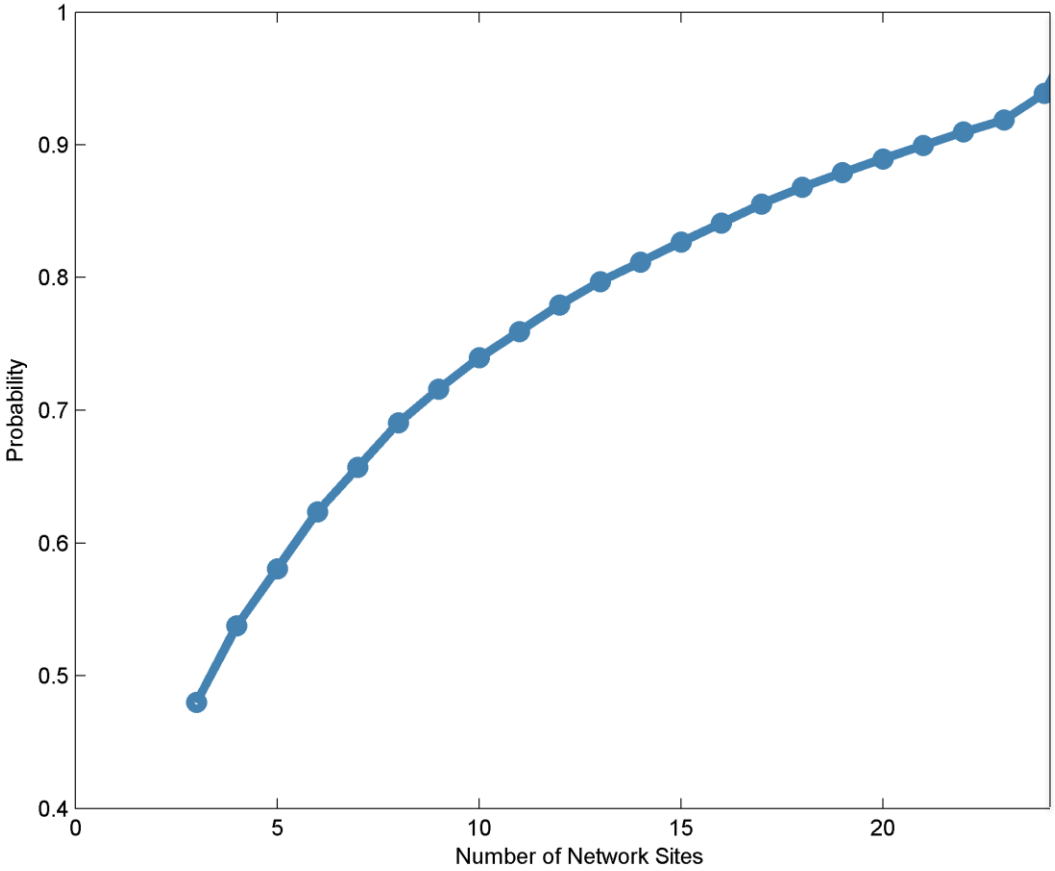


Average volumetric soil water content for each day of the campaign for the field and network sites. The error bars represent the range of the data.



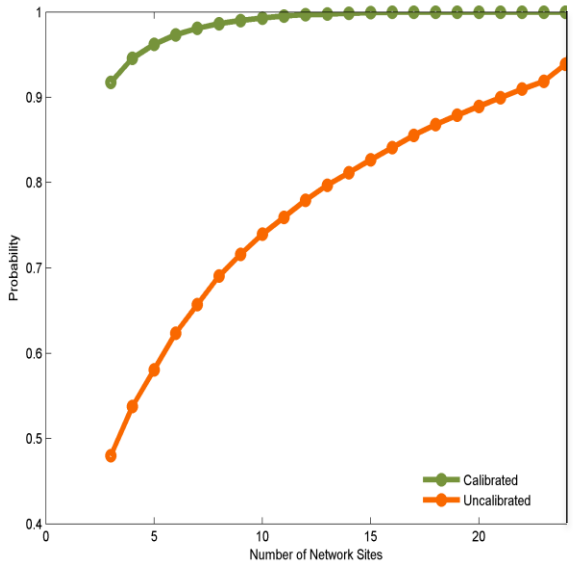
	Jun 2	Jun5	Jun 6	Jun 9	Jun 13	June 14
RMSE	0.031	0.034	0.032	0.048	0.037	0.031

How Many Network Sensors Are Necessary to Represent Regional Average Determined by Field Sampling (60 Fields)

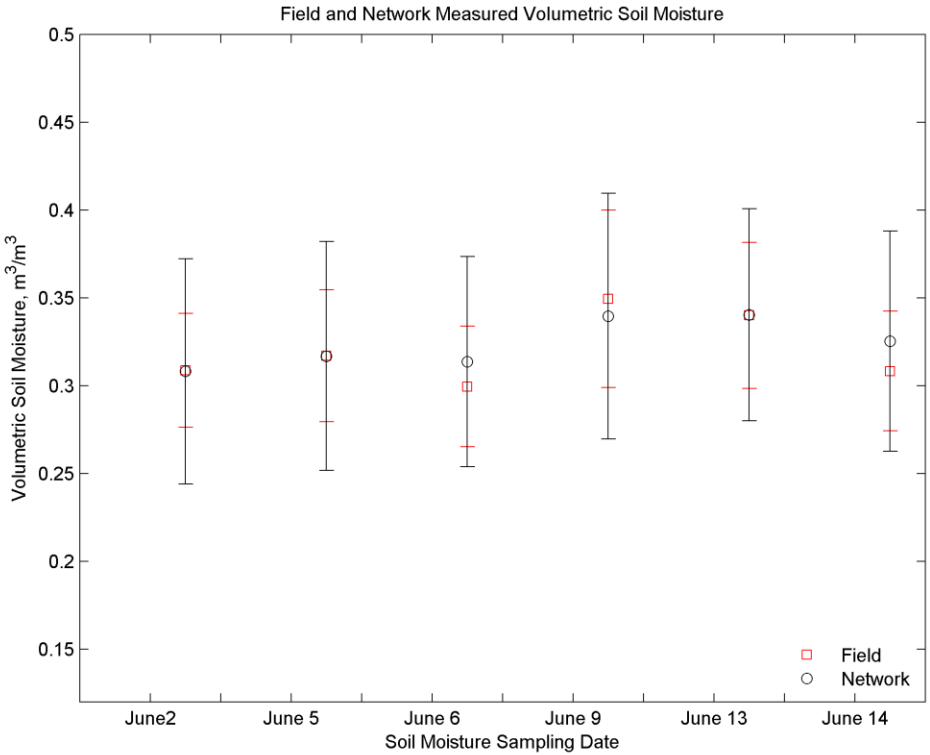


Probability that network mean (26 sensors) is <0.04 RMSE of Field Means (60 fields)

Calibrating the Network



Number of calibrated network sites are required to represent the regional mean soil moisture.



After calibration RMSE between Network and fields are reduced

Conclusions

- Based on CanEX-SM10 The Kenaston Network is representative of a regional area (at the SMAP, Passive Microwave scale) at <0.04 m^3m^{-3} (RMSE)
- The large number of sensors (40 when fully operational) suggest calibrations for lower sensors numbers may not necessary

Next Steps

- Summer 2013 – Networks are being refurbished with updated equipment
- EC (nested network) will be instrumented with telemetry equipment for near-real-time data acquisition
- New partners (Warren Helgason, Andrew Ireson, University of Saskatchewan) will be conducting further soil moisture variability work and instrumenting COSMOS sensors.

Acknowledgements

- Primary Funding Partners: Environment Canada, Canadian Space Agency, NSERC

- Numerous researchers and students who have assisted in CanEX-SM10 field campaigns, (AAFC, Sherbrook, Environment Canada, USDA, NASA)